Benefit-Cost Analysis for Tulalip Tribes TIGER 2013 Grant Application

Prepared for Tulalip Tribes

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ECONorthwest
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SUMMARY

ECONorthwest was contracted to calculate the present value of economic benefits and costs associated with the Tulalip Tribes' proposed improvements to the interchange at Interstate 5 and 116th Street near Marysville, WA, for the purpose of supporting the Tribes' TIGER 2013 grant application. This analysis follows the guidance provided in Appendix A to the Federal Register Notice and additional, subsequent guidance to TIGER III, TIGER 2012, and TIGER 2013 grant applicants from the US Department of Transportation.

This analysis relies on traffic modeling by Gibson Traffic Consultants, greenhouse gas emissions estimates by Parametrix, and accident rate and reduction estimates by Parametrix.

Costs and benefits were modeled year-by-year from 2013 through 2045, the 30th full year of operations for the improved facility. Present values, in 2013, of these streams of benefits and costs were calculated at the required discount rate of 7% and at the alternative discount rate of 3%.

- Using the required 7% discount rate, the present value in 2013 of costs net of reduced maintenance expenditures is $30.100 million and the present value of benefits through 2042 is $69.988 million. Net benefits are $39.889 million and the benefit/cost ratio is 2.33.
- Using the alternative 3% discount rate, the present value in 2013 of costs net of reduced maintenance expenditures is $29.827 million and the present value of benefits through 2042 is $144.038 million. Net benefits are $114.211 million and the benefit/cost ratio is 4.83.

Economic Benefits

The economic benefits reported here are the value, in dollars, of the benefits that would be produced by the proposed improvements to the 116th interchange. The value of these benefits may be compared directly to the cost of the project, and if they exceed the cost, the project is cost-beneficial. The benefits reported here all are attributable to the completion of the third phase of the overall project, given that the first two phases already have been built. The benefits being produced by the first two phases were not included. The costs we compare them to include all costs attributable to the third phase, including those funded from local sources.

The economic benefits reported here do not include the substantial economic development impacts that would accrue to the local area and Puget Sound region if the interchange were improved.

Construction is expected to be completed in September 2015. We assume benefits will begin October 1, 2015 and we count 3/12 of the benefits that would be produced in 2015 if the improved facility were operational all year. Full-year benefits are counted in subsequent years.

User Delay Benefits

To estimate user delay benefits, ECONorthwest relied on Synchro model runs from Gibson Traffic Consultants that simulate the operation of the interchange in the peak hour of a typical weekday. Synchro models were run for the existing interchange and the proposed interchange in 2014 and 2042. In all cases, the improvements from the first two phases were included in the model. These model runs estimate the number of seconds it takes a vehicle to traverse each link along their path through the interchange and connected roads. For each link, we multiplied the difference in travel time between the without- and with-improvement cases by the number of vehicles on that link and converted the result from seconds to hours. Because the number of vehicles was assumed to be the same with and without the improvement, no additional calculations were necessary to determine the value to those who used only the improved facility.

We then added up the hours over all links to get the hours of user delay benefits in the PM peak hour of a typical weekday. Those savings were 50.8 vehicle-hours in 2014 and 685.8 vehicle-hours in 2042. Because of the non-linear relationship between traffic volume and delay from congestion, the hours of delay increase faster than traffic volumes.

We then applied methods and formulas from the AASHTO User Benefit Analysis for Highways Manual to extrapolate delay from the peak hour to the typical weekday day and then to the entire year. Daily delay is estimated to be 2.56 times peak-hour delay and annual delay is estimated to be 300 times average weekday delay. There is significant traffic at this interchange on weekends. Applying these factors, we get 39,014.4 hours of delay reduction in 2014 and 526,694.4 hours of delay reduction in 2040.

To get from hours of benefit to dollars, we need to make assumptions about how users of the facility value their time. We used the assumptions in the federal guidance for TIGER grant applicants of $12.50 per hour for local autos, $18.00 per hour for intercity autos, and $24.70 per hour for trucks, all in 2009 dollars. Traffic counts indicate that 3.16% of the peak hour traffic is trucks, and we assumed conservatively that 50% of the auto traffic

is local, so we used a weighted average value of time of $16.53 in 2013 dollars. We also assumed that the real value of time would grow at an annual rate of 0.5 percent. For years between the years for which the model was run, user delay benefits (in hours) were interpolated assuming a constant rate of growth in benefits between modeled years.

The present value, in 2013, of user delay benefits for the first 30 years of operation is $38.298 million when discounted at the required, private real discount rate of 7% and $84.626 million when discounted at the alternative, public real discount rate of 3%.

Greenhouse Gas Benefits

Using the same Synchro model runs, Parametrix estimated the amount by which greenhouse gas emissions (carbon dioxide) would be reduced by replacing the interchange, which would increase vehicle speeds to more efficient levels, and reduce stopping, idling, and accelerating. Greenhouse gas emissions would be

Table 1: Calculation of User Delay Benefits

Year	Base Case Delay Hours	Improved Delay Hours	Delay Hours Reduction	Value of Delay Reduction	2013 PV @ 7%	2013 PV @ 3%
2015	330,355.5	285,467.1	11,222.1	187,336	163,626	176,582
2016	350,524.4	299,234.9	51,289.4	860,479	702,407	787,460
2017	371,924.5	313,666.7	58,257.8	982,273	749,372	872,737
2018	394,631.2	328,794.6	65,836.6	1,115,609	795,414	962,334
2019	418,724.2	344,652.0	74,072.2	1,261,437	840,549	1,056,434
2020	444,288.1	361,274.3	83,013.9	1,420,781	884,791	1,155,225
2021	471,412.7	378,698.2	92,714.6	1,594,743	928,155	1,258,905
2022	500,193.4	396,962.4	103,231.0	1,784,509	970,655	1,367,677
2023	530,731.1	416,107.5	114,623.6	1,991,356	1,012,304	1,481,756
2024	563,133.3	436,175.9	126,957.3	2,216,657	1,053,118	1,601,360
2025	597,513.6	457,212.3	140,301.3	2,461,890	1,093,108	1,726,720
2026	633,992.9	479,263.2	154,729.7	2,728,643	1,132,290	1,858,073
2027	672,699.4	502,377.6	170,321.8	3,018,626	1,170,675	1,995,667
2028	713,769.0	526,606.7	187,162.2	3,333,674	1,208,277	2,139,759
2029	757,345.9	552,004.5	205,341.4	3,675,764	1,245,109	2,290,615
2030	803,583.3	578,627.1	224,956.2	4,047,018	1,281,182	2,448,512
2031	852,643.6	606,533.7	246,109.9	4,449,715	1,316,510	2,613,739
2032	904,699.1	635,786.2	268,912.8	4,886,307	1,351,105	2,786,593
2033	959,932.6	666,449.6	293,483.1	5,359,427	1,384,978	2,967,385
2034	1,018,538.3	698,591.8	319,946.6	5,871,902	1,418,141	3,156,437
2035	1,080,722.0	732,284.2	348,437.8	6,426,770	1,450,607	3,354,083
2036	1,146,702.1	767,601.5	379,100.6	7,027,292	1,482,385	3,560,671
2037	1,216,710.5	804,622.2	412,088.3	7,676,970	1,513,489	3,776,560
2038	1,290,992.9	843,428.3	447,564.6	8,379,563	1,543,928	4,002,126
2039	1,369,810.5	884,106.0	485,704.5	9,139,107	1,573,713	4,237,756
2040	1,453,440.0	926,745.6	526,694.4	9,959,934	1,602,856	4,483,853
2041	1,542,175.3	971,441.6	570,733.6	10,846,691	1,631,366	4,740,837
2042	1,636,328.0	1,018,293.3	618,034.7	11,804,367	1,659,255	5,009,140
2043	1,736,228.9	1,067,404.6	668,824.3	12,838,313	1,686,532	5,289,215
2044	1,842,228.9	1,118,884.4	723,344.5	13,954,271	1,713,208	5,581,529
2045	1,954,700.4	1,172,847.1	781,853.3	15,158,399	1,739,292	5,886,568

reduced by 461 metric tons in 2014 and 8,153 metric tons in 2042.

Parametrix used grams-per-mile CO2 emissions estimates by 5-mph speed bin from the MOVES model that were provided to them by the Washington State Department of Transportation.

Annual reductions in carbon dioxide emissions were valued using the 3% SOC values from Table A-1 in *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866* prepared by the Interagency Working Group on Social Cost of Carbon, United States Government.

Per federal guidance for TIGER grant applicants, these values were discounted to present value at a rate of three percent in all cases, matching the assumption underlying the 3% SOC values. The 3% SOC values, which are in 2007 dollars, were converted to 2013 dollars my multiplying by 1.105, the ratio of the implicit price deflators for gross domestic product in the first quarter of each of those years.

Table 2: Calculation of Emissions Benefits

Year	Base Case Emissions (metric tons)	Improved Emissions (metric tons)	Emissions Reduction (metric tons)	3% Average SOC Value per Metric Ton	Value of Emissions Reduction (2007 dollars)	Value of Emissions Reduction (2013 dollars)	2013 PV @ 3% (2013 dollars)
2015	59,875	59,313	141	23.80	3,345	3,697	3,484
2016	62,336	61,665	671	24.30	16,309	18,021	16,492
2017	64,898	64,110	788	24.80	19,541	21,593	19,185
2018	67,566	66,652	913	25.30	23,101	25,527	22,020
2019	70,343	69,295	1,047	25.80	27,014	29,850	24,999
2020	73,234	72,043	1,190	26.30	31,306	34,593	28,127
2021	76,243	74,900	1,343	27.00	36,274	40,083	31,642
2022	79,377	77,870	1,507	27.60	41,595	45,963	35,226
2023	82,639	80,958	1,682	28.30	47,591	52,588	39,131
2024	86,036	84,168	1,868	28.90	53,983	59,651	43,093
2025	89,572	87,505	2,066	29.60	61,167	67,590	47,406
2026	93,253	90,975	2,278	30.20	68,795	76,019	51,765
2027	97,086	94,583	2,503	30.90	77,350	85,472	56,507
2028	101,076	98,333	2,743	31.50	86,403	95,476	61,282
2029	105,230	102,232	2,998	32.10	96,235	106,339	66,267
2030	109,555	106,286	3,269	32.80	107,226	118,485	71,685
2031	114,058	110,501	3,557	33.40	118,811	131,286	77,117
2032	118,746	114,882	3,863	34.10	131,738	145,571	83,017
2033	123,626	119,438	4,188	34.70	145,333	160,593	88,917
2034	128,707	124,174	4,533	35.40	160,476	177,326	95,321
2035	133,997	129,098	4,899	36.00	176,371	194,889	101,711
2036	139,504	134,217	5,287	36.70	194,044	214,419	108,644
2037	145,238	139,539	5,699	37.30	212,565	234,885	115,548
2038	151,207	145,072	6,135	37.90	232,513	256,927	122,710
2039	157,422	150,825	6,597	38.60	254,642	281,379	130,474
2040	163,892	156,805	7,086	39.20	277,782	306,949	138,185
2041	170,627	163,023	7,604	39.80	302,655	334,433	146,173
2042	177,640	169,487	8,153	40.40	329,372	363,957	154,444
2043	184,941	176,208	8,733	40.90	357,183	394,687	162,606
2044	192,542	183,195	9,347	41.50	387,898	428,627	171,445
2045	200,456	190,459	9,996	42.20	421,837	466,130	181,015

The present value, in 2013, of emissions benefits from the first 30 years of operations is $2.496 million when discounted at a real discount rate of 3%.

User Operating Cost Benefits

We did not attempt to estimate all user operating cost benefits, but the user benefits of reduced fuel consumption fall directly out of the emissions analysis. To achieve a one-ton reduction in carbon dioxide emissions, 119.6 fewer gallons of gasoline must be burned. We multiplied the emissions reductions by 119.6 to get the number of gallons saved and then multiplied the number of gallons by $3.50 in 2013 dollars to get the operating cost savings resulting from less waste of fuel. We did not assume any real price increase for motor fuel, although it is quite possible that the real price will increase between now and 2045.

The present value, in 2013, of operating cost benefits is $12.626 million when discounted at the required, private real discount rate of 7% and $26.904 million when discounted at the alternative, public real discount rate of 3%.

Table 3: Calculation of User Operating Cost Benefits

Year	Base Case Fuel (gallons)	Improved Fuel (gallons)	Fuel Use Reduction (gallons)	Value of Fuel Savings (2013 dollars)	2013 PV @ 7% (2013 dollars)	2013 PV @ 3% (2013 dollars)
2015	7,161,099	7,093,857	67,242	235,348	205,562	221,838
2016	7,455,418	7,375,149	80,269	280,943	229,333	257,102
2017	7,761,834	7,667,595	94,239	329,835	251,630	293,054
2018	8,080,843	7,971,638	109,205	382,218	272,516	329,705
2019	8,412,963	8,287,736	125,227	438,293	292,053	367,064
2020	8,758,733	8,616,369	142,364	498,274	310,300	405,142
2021	9,118,715	8,958,033	160,681	562,384	327,313	443,951
2022	9,493,491	9,313,245	180,245	630,859	343,146	483,501
2023	9,883,671	9,682,543	201,128	703,947	357,851	523,803
2024	10,289,886	10,066,484	223,403	781,909	371,479	564,868
2025	10,712,798	10,465,649	247,148	865,019	384,079	606,707
2026	11,153,090	10,880,643	272,448	953,567	395,696	649,333
2027	11,611,479	11,312,092	299,387	1,047,855	406,376	692,756
2028	12,088,707	11,760,649	328,058	1,148,203	416,162	736,988
2029	12,585,549	12,226,993	358,556	1,254,947	425,094	782,041
2030	13,102,812	12,711,829	390,983	1,368,439	433,213	827,928
2031	13,641,333	13,215,890	425,443	1,489,051	440,556	874,661
2032	14,201,988	13,739,938	462,049	1,617,172	447,162	922,251
2033	14,785,685	14,284,767	500,918	1,753,213	453,064	970,712
2034	15,393,372	14,851,200	542,173	1,897,604	458,296	1,020,056
2035	16,026,035	15,440,093	585,942	2,050,798	462,892	1,070,296
2036	16,684,700	16,052,338	632,363	2,213,270	466,882	1,121,446
2037	17,370,436	16,688,859	681,577	2,385,520	470,297	1,173,518
2038	18,084,356	17,350,621	733,735	2,568,072	473,165	1,226,525
2039	18,827,618	18,038,624	788,994	2,761,478	475,514	1,280,483
2040	19,601,427	18,753,908	847,519	2,966,317	477,370	1,335,403
2041	20,407,040	19,497,555	909,485	3,183,197	478,760	1,391,301
2042	21,245,763	20,270,690	975,073	3,412,756	479,707	1,448,190
2043	22,118,957	21,074,482	1,044,476	3,655,664	480,234	1,506,085
2044	23,028,040	21,910,146	1,117,893	3,912,627	480,365	1,565,001
2045	23,974,485	22,778,947	1,195,538	4,184,382	480,121	1,624,951

Safety Benefits

Over the three most recent years for which data are available, the interchange has experienced an average of 35.67 accidents per year, of which 12.67 were injury accidents. While the statewide accident rate decreased over those years, the number of accidents at this interchange grew at a rate of 8.6% per year due to the increased congestion and the tendency to back up onto the mainline of the freeway.

The traffic engineers at Gibson Traffic Consultants estimated that the new interchange design would cut the number of accidents in half relative to the number that would occur with the existing interchange. In 2016, there would be 6.59 fewer injury accidents and 16.00 fewer non-injury accidents.

As the traffic through the interchange gets slower and more closely packed, the number of accidents will continue to increase, but the proportion of those resulting in injury should decrease. We assumed that non-injury accidents would continue to grow at 8.6% per year, but we assumed conservatively that injury accidents would grow at only 1% per year. In 2040, the improvement would lead to 8.37 fewer injury accidents and 116.22 fewer non-injury accidents.

Federal guidance for TIGER applications recommends valuing non-injury accidents at $3,206 per involved vehicle in 2010 dollars. We assumed 1.84 vehicles per accident and multiplied by the ratio of GDP deflators (1.056) to get to $6,232 in 2013 dollars. To value injury accidents, we applied the weights for "injury severity unknown" from the KABCO-AIS conversion table to the unit values by AIS level, both from federal guidance, resulting in a value of $164,966 per injury accident in 2012 dollars, or $167,816 in 2013 dollars. These amounts are per accident and include damages to all involved people and property. The value of safety benefits grows from $1.206 million in 2016 to $2.128 million in 2040.

The present value, in 2013, of safety benefits from the first 30 years of operations is $16.568 million when discounted at the required, private real discount rate of 7% and $30.012 million when discounted at the optional, public real discount rate of 3%.

Table 4: Value of Accident Reductions (per federal guidance)

AIS Level	Weight	Value in 2012$	Weighted Value
0	0.21538	$-	$-
1	0.62728	$ 27,300	$ 17,125
2	0.10400	$ 427,700	$ 44,481
3	0.03858	$ 955,500	$ 36,863
4	0.00442	$ 2,420,600	$ 10,699
5	0.01034	$ 5,396,300	$ 55,798
6	0.00000	$ 9,100,000	$-
All	1.00000		$ 164,966
Property Damage Only (2010$)			$ 3,206

Agency Costs

Costs attributable to this project include $4.5 million of construction costs in 2013, $18.0 million of construction costs in 2014, and $13.5 million of construction costs in 2015. Without the improvement, there would be major maintenance or preservation expenditures in 2016, 2017, 2026, and 2036 on the unimproved facility. The improved facility would require major maintenance/ preservation expenditures of $3.780 million in 2045.

The present value, in 2013, of construction costs is $33.114 million when discounted at the required, private real discount rate of

Table 5: Calculation of Safety Benefits

Year	Base Case Injury	Base Case PDO	Improved Injury	Improved PDO	Injury Reduction	PDO Reduction	Injury $	PDO $	Safety $	2013 PV @ 7%	2013 PV @ 3%
2015	13.05	29.47	6.53	14.73	1.63	3.68	273,760	22,956	296,717	259,164	279,684
2016	13.18	32.01	6.59	16.00	6.59	16.00	1,105,992	99,733	1,205,725	984,231	1,103,409
2017	13.31	34.76	6.66	17.38	6.66	17.38	1,117,052	108,322	1,225,374	934,832	1,088,729
2018	13.45	37.76	6.72	18.88	6.72	18.88	1,128,223	117,650	1,245,873	888,290	1,074,701
2019	13.58	41.01	6.79	20.50	6.79	20.50	1,139,505	127,782	1,267,287	844,447	1,061,333
2020	13.72	44.54	6.86	22.27	6.86	22.27	1,150,900	138,787	1,289,687	803,152	1,048,634
2021	13.85	48.38	6.93	24.19	6.93	24.19	1,162,409	150,740	1,313,149	764,264	1,036,612
2022	13.99	52.54	7.00	26.27	7.00	26.27	1,174,033	163,721	1,337,754	727,650	1,025,277
2023	14.13	57.07	7.07	28.53	7.07	28.53	1,185,773	177,821	1,363,594	693,182	1,014,642
2024	14.27	61.98	7.14	30.99	7.14	30.99	1,197,631	193,135	1,390,766	660,743	1,004,719
2025	14.42	67.32	7.21	33.66	7.21	33.66	1,209,607	209,768	1,419,375	630,220	995,521
2026	14.56	73.12	7.28	36.56	7.28	36.56	1,221,704	227,833	1,449,537	601,506	987,064
2027	14.71	79.41	7.35	39.71	7.35	39.71	1,233,921	247,454	1,481,375	574,503	979,363
2028	14.85	86.25	7.43	43.13	7.43	43.13	1,246,260	268,765	1,515,025	549,115	972,437
2029	15.00	93.68	7.50	46.84	7.50	46.84	1,258,722	291,911	1,550,634	525,253	966,304
2030	15.15	101.75	7.58	50.87	7.58	50.87	1,271,310	317,051	1,588,360	502,834	960,984
2031	15.30	110.51	7.65	55.26	7.65	55.26	1,284,023	344,355	1,628,378	481,778	956,500
2032	15.46	120.03	7.73	60.01	7.73	60.01	1,296,863	374,011	1,670,874	462,011	952,876
2033	15.61	130.37	7.81	65.18	7.81	65.18	1,309,832	406,221	1,716,053	443,461	950,137
2034	15.77	141.59	7.88	70.80	7.88	70.80	1,322,930	441,205	1,764,135	426,062	948,310
2035	15.92	153.79	7.96	76.89	7.96	76.89	1,336,159	479,202	1,815,361	409,751	947,423
2036	16.08	167.03	8.04	83.52	8.04	83.52	1,349,521	520,471	1,869,992	394,469	947,509
2037	16.24	181.42	8.12	90.71	8.12	90.71	1,363,016	565,294	1,928,310	380,160	948,601
2038	16.41	197.04	8.20	98.52	8.20	98.52	1,376,646	613,978	1,990,624	366,771	950,733
2039	16.57	214.01	8.29	107.00	8.29	107.00	1,390,413	666,854	2,057,266	354,252	953,943
2040	16.74	232.44	8.37	116.22	8.37	116.22	1,404,317	724,283	2,128,600	342,556	958,272
2041	16.90	252.46	8.45	126.23	8.45	126.23	1,418,360	786,659	2,205,019	331,640	963,762
2042	17.07	274.20	8.54	137.10	8.54	137.10	1,432,544	854,406	2,286,950	321,460	970,459
2043	17.24	297.81	8.62	148.91	8.62	148.91	1,446,869	927,988	2,374,857	311,978	978,410
2044	17.42	323.46	8.71	161.73	8.71	161.73	1,461,338	1,007,90	2,469,244	303,157	987,666
2045	17.59	351.32	8.80	175.66	8.80	175.66	1,475,951	1,094,70	2,570,659	294,960	998,282

7% and $34.701 million when discounted at the optional, public real discount rate of 3%.

The present value, in 2013 of the difference in maintenance and preservation costs is $3.041 million when discounted at the required, private real discount rate of 7% and $4.874 million when discounted at the optional, public real discount rate of 3%.

When calculating benefit cost ratios, we count the maintenance-cost savings as an offset to agency costs in the denominator, rather than as a benefit in the numerator.

Benefit-Cost Comparison

At a 7% discount rate, the present value of benefits attributable to this project add up to $69.988 million and the present value of costs add up to $30.100 million. The net benefits are $39.889 million and the benefit-cost ratio is 2.33. Benefits from reduced CO_2 emissions are discounted at 3% in all cases, per federal guidance.

At a 3% discount rate, the present value of benefits attributable to this project add up to $144.038 million and the present value of costs add up to $29.827 million. The

net benefits are $114.211 million and the benefit-cost ratio is 4.83. Since the non-TIGER funds committed to this project will be used to fund other public projects if this application is unsuccessful, the public discount rate may be appropriate.

The following table shows, for each year from 2013 to 2045 (the 30th full year of operations) the construction costs, maintenance costs, total costs, user delay benefits, emissions benefits, safety benefits, user operating cost benefits, total benefits, and net benefits. It also shows the present values of these streams at 7% and 3% discount rates and benefit-cost ratios.

Table 6: Benefit-Cost Analysis Summary for Proposed 116th Interchange Improvements

Year	Construction Costs	Maintenance Costs	Total Costs	User Delay Benefits	Emissions Benefits*	Safety Benefits	Operating Expense Benefits	Total Economic Benefits	Net Economic Benefits
2013	(4,500,000)	-	(4,500,000)	-	-	-	-	-	(4,500,000)
2014	(18,000,000)	-	(18,000,000)	-	-	-	192,870	192,870	(17,807,130)
2015	(13,500,000)	-	(13,500,000)	187,336	3,697	296,717	235,348	723,097	(12,776,903)
2016	-	1,290,750	1,290,750	860,479	18,021	1,205,725	280,943	2,365,167	3,655,917
2017	-	557,000	557,000	982,273	21,593	1,225,374	329,835	2,559,075	3,116,075
2018	-	(3,000)	(3,000)	1,115,609	25,527	1,245,873	382,218	2,769,227	2,766,227
2019	-	(3,000)	(3,000)	1,261,437	29,850	1,267,287	438,293	2,996,868	2,993,868
2020	-	(3,000)	(3,000)	1,420,781	34,593	1,289,687	498,274	3,243,335	3,240,335
2021	-	(3,000)	(3,000)	1,594,743	40,083	1,313,149	562,384	3,510,358	3,507,358
2022	-	(3,000)	(3,000)	1,784,509	45,963	1,337,754	630,859	3,799,085	3,796,085
2023	-	(3,000)	(3,000)	1,991,356	52,588	1,363,594	703,947	4,111,486	4,108,486
2024	-	(3,000)	(3,000)	2,216,657	59,651	1,390,766	781,909	4,448,983	4,445,983
2025	-	(3,000)	(3,000)	2,461,890	67,590	1,419,375	865,019	4,813,874	4,810,874
2026	-	1,197,000	1,197,000	2,728,643	76,019	1,449,537	953,567	5,207,765	6,404,765
2027	-	(3,000)	(3,000)	3,018,626	85,472	1,481,375	1,047,855	5,633,327	5,630,327
2028	-	(3,000)	(3,000)	3,333,674	95,476	1,515,025	1,148,203	6,092,378	6,089,378
2029	-	(3,000)	(3,000)	3,675,764	106,339	1,550,634	1,254,947	6,587,684	6,584,684
2030	-	(3,000)	(3,000)	4,047,018	118,485	1,588,360	1,368,439	7,122,302	7,119,302
2031	-	(3,000)	(3,000)	4,449,715	131,286	1,628,378	1,489,051	7,698,430	7,695,430
2032	-	(3,000)	(3,000)	4,886,307	145,571	1,670,874	1,617,172	8,319,925	8,316,925
2033	-	(3,000)	(3,000)	5,359,427	160,593	1,716,053	1,753,213	8,989,287	8,986,287
2034	-	(3,000)	(3,000)	5,871,902	177,326	1,764,135	1,897,604	9,710,968	9,707,968
2035	-	(3,000)	(3,000)	6,426,770	194,889	1,815,361	2,050,798	10,487,819	10,484,819
2036	-	4,309,500	4,309,500	7,027,292	214,419	1,869,992	2,213,270	11,324,973	15,634,473
2037	-	(3,000)	(3,000)	7,676,970	234,885	1,928,310	2,385,520	12,225,684	12,222,684
2038	-	(3,000)	(3,000)	8,379,563	256,927	1,990,624	2,568,072	13,195,185	13,192,185
2039	-	(3,000)	(3,000)	9,139,107	281,379	2,057,266	2,761,478	14,239,230	14,236,230
2040	-	(3,000)	(3,000)	9,959,934	306,949	2,128,600	2,966,317	15,361,800	15,358,800
2041	-	3,917,000	3,917,000	10,846,691	334,433	2,205,019	3,183,197	16,569,340	20,486,340
2042	-	(3,000)	(3,000)	11,804,367	363,957	2,286,950	3,412,756	17,868,029	17,865,029
2043	-	(3,000)	(3,000)	12,838,313	394,687	2,374,857	3,655,664	19,263,521	19,260,521
2044	-	(3,000)	(3,000)	13,954,271	428,627	2,469,244	3,912,627	20,764,769	20,761,769
2045	-	(3,783,000)	(3,783,000)	15,158,399	466,130	2,570,659	4,184,382	22,379,570	18,596,570
PV at 7%*	(33,113,853)	3,014,312	(30,099,541)	38,298,395		16,567,851	12,626,440	69,988,325	**39,888,785**
PV at 3%	(34,700,773)	4,873,768	(29,827,005)	84,626,306	2,495,639	30,012,298	26,903,911	144,038,154	**114,211,149**
	B/C ratio at 7%	**2.33**							
	B/C ratio at 3%	**4.83**							

*Per federal guidance, benefits from reduced CO2 emissions are valued using 3%SOC values and always discounted at 3%.